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The Air Line Pilot

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Season's Greetings To All

The Air Line Pilot

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On the Cover

Nowadays commercial airliners not only fly across polar regions, they land, discharge and pick up passengers and cargo.

The cover picture of the December issue of THE AIR LINE PILOT shows the PAA Stratocruiser "America," on the ground at McMurdo Sound, Antarctica —the first commercial flight into the South Pole region.

First Stewardesses

Another first was established by the flight too. It was the first time women —PAA hostesses—were ever that far south.

The Stratocruiser was in command of Capt. Ralph Savory of Seattle, chief pilot of PAA's Alaska region and a man who has more than a quarter of a century of experience flying under arctic conditions. He is an ALPA executive inactive.

New Instruments

Used on the flight were two recently developed instruments which have been successful on Pan American's polar route from the Pacific Coast to Europe.

One is a new type of gyro-compass, replacing the ordinary magnetic compass which has a tendency to become erratic and sluggish in the vicinity of the magnetic poles.

The second is a "sky compass," an instrument similar to a sextant, which polarizes light rays from the sun and makes it possible for navigators to check the heading of an aircraft even though the sun may be well below the horizon.

Long Haul

Stops on the flight were made at Honolulu, Canton Island, Nandi in the Fiji Islands, and Christchurch, New Zealand, where it arrived October 14.

The Navy contracted with PAA to embark 37 passengers—officers and men of the Antarctic Mobile Construction Battalion (Sea Bees), civilian technicians, personal gear and freight.

Upon arrival at McMurdo, the big Stratocruiser landed on a 6,000-foot runway constructed by the Sea Bees last year on 15-foot thick bay ice adjacent to the Navy McMurdo base at Hut Point.

The runway is surfaced with what the Navy calls "ice concrete," a hard frozen mixture of snow, chopped ice and water.

THE AIR LINE PILOT

Is He An "Organization Man"?

By C. W. Karraker
PAA

While reading "The Organization Man," by William H. Whyte, Jr., last month I was brought up short by the following passage (p. 283) dealing with the Park Forest Development in Chicago:

". . . Park Forest quickly became a haven for the organization man. Out came trainees for the big corporations, research chemists with the A.E.C., captains and majors with the Fifth Army, *air line pilots,* F.B.I. men—in total, a cross section of almost every kind of *organization man* in America." (Italics mine.)

Mention of air line pilots in Whyte's catalog of typical "organization men" made me speculate about our being included. I was never able to find an explicit statement in the book about what an "Organization Man" was, but from what was said about him I got the impression he wasn't a good thing to be.

Confusin'

Whyte doesn't seem too sure himself because on one hand he characterizes the "Organization Man" as a hopeless and willing prisoner of the "System," and in his final paragraphs he beseeches him to "fight the Organization." The book is confusing, and I hope that you won't bother to wade through it. But it is a good springboard for diving into the question of our own meaning of "Organization Man," and into what may be some valuable considerations for the future.

Let's take a dim view of an "Organization Man" in our own description. We can say simply that he's a fellow who has almost submerged his individuality and essential humaneness. He is devoid of ideas, and perfectly passive as long as his creature comforts and his social status are not disturbed. The extent to which this description applies in the air line pilot group defines the problem.

There are forces at work within our industry which, if not countered, may very well result in extinction for the type of man who flies today's transports. Brief-case brains and other related matters have been ably discussed recently in THE AIR LINE PILOT by Captain F. E. W. Smith, that very astute Trans-Canada pilot who flies and writes out of Vancouver.

Plus and Minus

I'd like to offer a variation on his theme by first treating two opposing characteristics which a good air line pilot must have in proper proportion to achieve excellence in his work. They are Resourcefulness and Standardization. What Smith appeared to be driving at, and I think he is dead right, is that the making of an absolute god of Standardization (automatic reaction) is crowding that valuable trait, Resourcefulness, right out of the picture.

Few of us seem to realize that were it possible to achieve perfect standardization of pilot practices and activities you, sir, . . . yes, you in the left seat too, . . . you could be replaced by a detector, and amplifier, and a servo system. The passengers won't stand for a guided missile trip? Don't kid yourself!

I took a 700-mile trip on a domestic trunk line the other day, and we passengers might just as well have been in a guided missile. There wasn't a sign of life from the front end. Once en route we made a 360° turn—probably for ATC

Check Yourself On These: Are You A Slave To The Printed Form? Contributing To The Extinction Of Your Profession? Your Brains In Your Briefcase? Who Commands Your Aircraft?

reasons—but never a word came back to the customers who, for the first half of the turn, thought we were returning to our departure point.

Prehistoric

If the air line pilot ever lets himself become a mere manipulator of controls the breed as we know it pass out of existence.

Resourcefulness is a trait we all need to keep oiled, loaded and ready for action. Manuals can never keep up with changing conditions, and what's in them is usually the result of some person's resourcefulness. When those results cease to come predominantly from pilots we'll be on the skids.

Smith didn't say that we should disregard the manuals, but that we should keep a careful watch over them to assure their contents jibe with good operating practices.

Alertness for ways to improve the industry is a valuable characteristic of many air line pilots. Such idea men save the profession and our Association from becoming parasites on Air Transport. Such men are, neither in Whyte's sense nor mine, "organization men." and they set tone and goal for the whole pilot group.

Gladhand Time

Automation is nothing to be afraid of. Increased automatic flight frees the pilots, not only for planning and decision making, but for participating in Sales and Service. Continuity for today's kind of pilot would be assured if more of us read, and acted upon Kurtz's "Common Man Up in the Air," that fine publication of the Flight Safety Foundation dealing with making flying a pleasure for the public.

The air line pilot is in a fortunate spot in his industry. One needs only to read C. Wright Mill's "White Collar," to learn what a lucky day it was for us when Dave Behncke and ALPA's founders took us fully into the Labor Movement by early affiliation with the A. F. of L.

We have our cake and eat it too. We have union support in collective bargaining, and we have the freedom from drudgery necessary for us to be able to make our own decisions and produce our own ideas. Management personnel just don't have time to study fully and act upon all the myriad details of our business.

Many of them resist the assistance and advice of their pilots, but they don't last long if they do. Good managers welcome ideas, and keep communications channels wide open for their flow. On my own line non-management pilots sit in on management staff meetings and help deal with problems not affected by collective bargaining.

In With The Boys

You may have noticed a couple of odd quirks in some flight managers. For one thing, they hoard information; probably so they can feel comfortably secure that they're "in the know" and their subordinates aren't. It's supposed to be a badge of power to have information others don't have. The only catch is that the success of the enterprise that's being managed suffers from such individual indulgence. Other inferior managers manage, just to be managing. They forget that much of their work load comes from issuing orders that wouldn't have to be issued if their subordinates simply knew the score. Good managers keep their people informed, keep the channels of communication virtually frictionless, and get results with half the effort.

Air line pilots who are not supine "organization men" don't stand for poor managers. It's so easy to pull the rug from under such men, and to move good managers along by giving them all-out support.

Good and Bad

It isn't always true that what's good for the air transport industry is good for air line pilots. But the converse is almost always true. What's bad for the industry is usually bad for pilots.

For example, every accident hurts every pilot's job and pocketbook to some extent. Those non-organization men, the resourceful bunch who daily work at some project designed to contribute to air safety, are whacking away at the accident rate. We'll never know how many accidents have been averted by such efforts, but we can be confident that many have.

For further example, many technicological improvements result in demotions and furloughs of pilots while being advantageous to the air transport business as a whole. Alert ALPA easing of the impact of larger and faster

(Continued on Page 23)

A Whimsical View Of The Air Line Pilot Vs. Automation.

The Air Line Pilots And Mobilization

Pilots Are Part Of The CRAF And WASP Programs, Which Are Really Equipment And Personnel Pools The Air Lines Must Furnish In The Event Of All-Out War Effort.

By Roy Dooley, AA
Chairman ALPA Military Affairs Committee

EDITOR'S NOTE: The Military Affairs Committee has found the membership of ALPA has had little information about the CRAF and WASP programs, even though the implementation of these programs will affect every air line pilot. The following article is being published at the request of the Committee for the information of the membership of ALPA.

The Civil Reserve Air Fleet (CRAF) and the War Air Service Pattern (WASP) are the names given to the pool of equipment and personnel the civil air lines have to furnish for any all-out U. S. war effort.

The CRAF program consists of agreements between 25 air lines and the government to furnish an already agreed upon number of four engine airplanes, ground personnel and flight crews for emergency operation of an airlift in support of any all-out war effort. All of this will be done within 48 hours.

The CRAF program has been set up to provide an emergency assist to the regular air transport system already in being within the air force.

Typical Set-Up

To better explain the CRAF program and how it might effect you, we will use air line "X," as a typical air line and how it has been set up for the CRAF operation.

To start with, the air line has designated one or more members of management as the CRAF representatives for that air line. These men co-ordinate the CRAF program for their air line. Air line "X," has a certain percentage of its four engine fleet committed to CRAF. This figure is not a secret figure and can be ascertained by questioning the CRAF representative on any CRAF air line. The exact airplanes by "N," number are known.

It has been planned so that not one air line will furnish its entire fleet unless it has been agreed upon for reasons of its own. In other words, they have attempted to spread the work over several air lines instead of crippling any one line, such as happened in World War II.

In return for committing certain planes to CRAF, the air line received financial assistance in regards to the specific airplane. That, however, is of no concern to the pilots, since we fly them no matter how or who paid for them.

Black Boxes

The planes listed as CRAF equipment on air line "X" have had some engineering changes made in order to accommodate some black boxes that will be put in the plane when it is called up.

These changes have either been made at time of manu-

facture, at some agreed time since delivery was made, or they have been scheduled for these changes at a particular place and time in the future.

The black boxes have been stockpiled and are ready to be placed in the planes.

The general areas of operation for each air line in CRAF is known and is not secret.

Specific areas and bases have been assigned to certain air lines for their control and operation. These are known and are not secret.

The air lines have been told to furnish 3½ crews per airplane. The U. S. Air Force will furnish the navigators. The air lines will furnish the ground personnel to maintain these planes.

WASP Program

The WASP program includes all the air line planes and personnel, not assigned to CRAF, to be operated in such a way as to maintain an air transportation system within the United States.

The whole operation is predicated and planned to be a civilian affair, on a contract basis between the government and the air lines involved. Those contracts are being drawn up now.

There has been no indication of planning to place air line pilots in any military uniform in case of hostility. However, the air line pilot fits into the planning and will be used since the speed of movement of men and supplies will be extremely important.

The question that now faces the air line pilots is, "who goes on CRAF and who goes on WASP and how do we decide?"

It is impossible for the air line pilots to determine the war plans for the country. All we can do is to do our part to successfully fulfill that part of the over-all plans allocated to the air line pilots. We have been allocated to CRAF and WASP. We are expected to do our part there.

The ALPA board of directors will receive the report of the Military Affairs Committee shortly, in which we will make our recommendations on how we believe the Association should proceed in order to settle the problems the CRAF and WASP programs will create for the air line pilots.

Around The World In Forty-Eight Hours

Eastbound The Sun Will Rise Three Times In Two Days, Westbound Only Once. And Then There's The Problem Of Jibing Stomach And Zone Time, Too

Flying around the world in 48 hours, which will be possible when America's new turbo-jet transports enter airline service, poses problems of a sort that never concerned Phileas Fogg, hero of *Around the World in 80 Days.*

Travelers will operate on two times—Stomach Time and Zone Time. For example, a traveler departing from the West Coast Friday at 4:00 p.m. local time on an eastbound jet flight around the world would find himself in Karachi, Pakistan, about 24 hours later, but the Karachi clock and calendar would tell him that it was 3:40 a.m., Sunday. His stomach would insist that it was close to dinner time, but the clock would be equally insistent that it was approaching time for breakfast of the following day.

The airlines are well aware of these problems and carefully plan their flights and meal service to eliminate such conflicts whenever possible. But the long-distance traveler simply must stomach his problems.

The timetable shown here illustrates the differences in Stomach Time and Zone Time encountered in around-the-world flights in opposite directions.

A passenger flying east from the West Coast would arrive in Paris at noon local time although his stomach would be telling him it was 3:10 a.m. It gets even more complicated as the flight continues east. The traveler's Saturday would last only 13 hours, and Sunday would be divided by Monday. By the time he departed Tokyo it would be Monday, but Sunday would pop up again when he crosses the International Dateline and arrives back at his original point of departure.

The westbound flight is equally amazing. The swift jet transport would be traveling with the sun and only an hour's time would be consumed every few thousand miles. If he departed westbound at 4:00 p.m. West Coast time, passing the International Dateline would cut Saturday in half, but his Sunday would then be 40 hours long. The eastbound passenger would see the sun rise three times in 48 hours, but the westbound passenger would have only one morning during the entire trip.

Progress of the aircraft industry in designing faster, more comfortable aircraft may one day find aircraft flying at the same speed of the sun and time will stand still.

Jet Transport Around-The-World Timetable

EASTBOUND

STOMACH TIME (SAN FRANCISCO)		ZONE TIME
4:00 pm Friday	Lv San Francisco	4:00 pm Friday
8:12 pm	Ar New York	11:12 pm
9:00 pm	Lv New York	Midnight
3:10 am Saturday	Ar Paris	12:10 pm Saturday
7:00 am	Lv Paris	4:00 pm
10:55 am	Ar Beirut	8:55 pm
Noon	Lv Beirut	10:00 pm
3:40 pm	Ar Karachi	3:40 am Sunday
5:00 pm	Lv Karachi	5:00 am
10:18 pm	Ar Saigon	2:18 pm
11:30 pm	Lv Saigon	3:30 pm
4:50 am Sunday	Ar Tokyo	9:55 pm
7:00 am	Lv Tokyo	Midnight
4:10 pm	Ar San Francisco	4:10 pm Sunday

WESTBOUND

STOMACH TIME (SAN FRANCISCO)		ZONE TIME
4:00 pm Friday	Lv San Francisco	4:00 pm Friday
1:10 am Saturday	Ar Tokyo	6:10 pm Saturday
5:00 am	Lv Tokyo	10:00 pm
10:09 am	Ar Saigon	2:09 am Sunday
11:00 am	Lv Saigon	3:00 am
4:18 pm	Ar Karachi	4:18 am
5:00 pm	Lv Karachi	5:00 am
8:40 pm	Ar Beirut	6:40 am
9:30 pm	Lv Beirut	7:30 am
1:25 am Sunday	Ar Paris	10:25 am
9:00 am	Lv Paris	6:00 pm
3:10 pm	Ar New York	6:10 pm
7:30 pm	Lv New York	10:30 pm
11:42 pm	Ar San Francisco	11:42 pm

CAUTION: *Slippery Runways*

Some Timely Tips On Techniques When Landing On Slippery Runways

By Flight Safety Foundation

Every once in a while a pilot "paints one on." And, when this happens on a wet runway, he may not be able to notice the exact moment of touchdown. He may have made the approach a little "hotter" to allow more time to "ease it on."

Despite what may appear to be the "perfect landing," a wet runway and/or excess approach speed does not make for "perfect landing" conditions.

The following material, obtained from a Flight Safety Foundation Bulletin, explains why and brings to light much information about factors affecting braking action.

A study of over-run accidents indicates that in a majority of cases the accident resulted from a combination of excessive speed and a slippery runway surface. In many instances the landing distance available, even allowing for the slippery surface, was at least theoretically adequate. A more accurate knowledge of the adverse effect of slippery runway surface, excessive speed and the correct technique to reduce landing roll under these conditions would have prevented the accidents.

When considering the landing techniques suggested here, they should be studied in relation to other phases of the approach. They are not recommended as the only procedures to be employed irrespective of local conditions.

Increase In Landing Distances

To show pilots the effect on the landing roll of adverse runway conditions and departures from the optimum landing technique, Table 1 has been prepared. It indicates the effect of various techniques and runway conditions on the landing distances of typical present-day piston-engine transports. For purposes of comparison, a basic landing distance is shown at the top of the diagram, and presupposes normal operating conditions and a representative airline technique. Take particular note of the effect of intermittent brake application: on a typical transport a 5-second delay in applying brakes after touchdown costs 225 feet on a dry runway.

Characteristics of a typical transport are assumed to be.

a. nosewheel landing gear;

b. non-automatic brakes of average power (0.25 g with brakes at limiting torque);

c. four piston engines; reserve pitch not used;

d. stalling speeds:

landing flap	90 knots
approach flap	91 knots
T/O flap	97 knots
flaps up	105 knots

Normal operating techniques assume the following values of speed and height:

Threshold height: height of the wheels over beginning of runway is assumed to be 20 feet in conditions of light wind and with aircraft flown in normal manner.

Threshold speed: assumed to be 115 knots.

Touchdown speed: 110 knots.

Mechanics Of Landing Roll

When considering the mechanics of the landing roll (Fig. 1), remember that the greater part of the roll is covered

EFFECT OF VARIOUS TECHNIQUES AND CONDITIONS ON LANDING DISTANCE

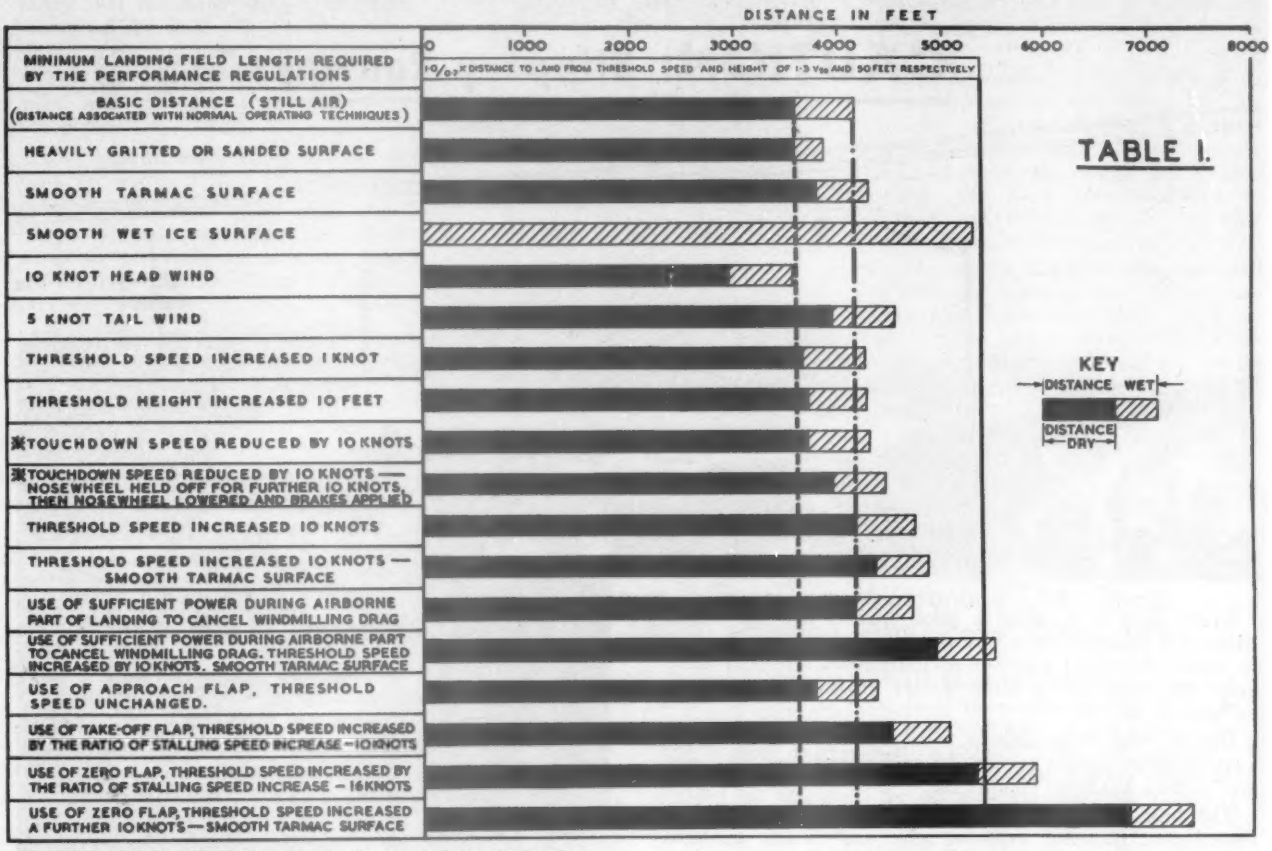

DISTANCE IN FEET
0
1000
2000
3000
4000
5000
6000
7000
8000
MINIMUM LANDING FIELD LENGTH REQUIRED BY THE PERFORMANCE REGULATIONS
1·0/0·7 X DISTANCE TO LAND FROM THRESHOLD SPEED AND HEIGHT OF 1·3 V50 AND 50 FEET RESPECTIVELY
BASIC DISTANCE (STILL AIR) (DISTANCE ASSOCIATED WITH NORMAL OPERATING TECHNIQUES)
HEAVILY GRITTED OR SANDED SURFACE
SMOOTH TARMAC SURFACE
SMOOTH WET ICE SURFACE
10 KNOT HEAD WIND
5 KNOT TAIL WIND
THRESHOLD SPEED INCREASED 1 KNOT
THRESHOLD HEIGHT INCREASED 10 FEET
*TOUCHDOWN SPEED REDUCED BY 10 KNOTS
*TOUCHDOWN SPEED REDUCED BY 10 KNOTS — NOSEWHEEL HELD OFF FOR FURTHER 10 KNOTS, THEN NOSEWHEEL LOWERED AND BRAKES APPLIED
THRESHOLD SPEED INCREASED 10 KNOTS
THRESHOLD SPEED INCREASED 10 KNOTS — SMOOTH TARMAC SURFACE
USE OF SUFFICIENT POWER DURING AIRBORNE PART OF LANDING TO CANCEL WINDMILLING DRAG
USE OF SUFFICIENT POWER DURING AIRBORNE PART TO CANCEL WINDMILLING DRAG. THRESHOLD SPEED INCREASED BY 10 KNOTS. SMOOTH TARMAC SURFACE
USE OF APPROACH FLAP, THRESHOLD SPEED UNCHANGED.
USE OF TAKE-OFF FLAP, THRESHOLD SPEED INCREASED BY THE RATIO OF STALLING SPEED INCREASE — 10 KNOTS
USE OF ZERO FLAP, THRESHOLD SPEED INCREASED BY THE RATIO OF STALLING SPEED INCREASE — 16 KNOTS
USE OF ZERO FLAP, THRESHOLD SPEED INCREASED A FURTHER 10 KNOTS — SMOOTH TARMAC SURFACE
KEY
DISTANCE WET
DISTANCE DRY

TABLE I.

* USING NORMAL THRESHOLD SPEED AND PROLONGING HOLD-OFF

at a relatively high speed. When the aircraft is slowing down, the time spent in each equal band of speed (100 to 90 knots, 90 to 80 knots, etc.) is roughly the same, but the distance covered is proportional to the mean speed of the band (95 knots, 85 knots, etc.)

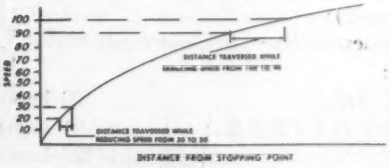


Fig. 1

Effect Of Wing Lift

During the landing roll, the aircraft is retarded by aerodynamic drag and the use of brakes. The aerodynamic drag, excluding that due to the propellers, varies as the square of the airspeed. Wing lift is also proportional to the square of the airspeed. Thus, at higher speeds, the weight on the wheels is considerably reduced (Fig. 2). However, for a given coefficient of friction

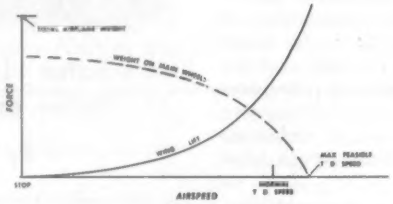


Fig. 2

between tire and runway, the maximum retarding force the brakes provide is proportional to the weight on the wheels (in modern aircraft the brakes are sufficiently powerful to lock the wheels at most speeds on a wet surface). Therefore, the retarding force of the brakes is reduced at high speed. If we were to assume that the coefficient of friction between the tire and the runway remained constant, the relative contribution of aerodynamic drag and braking drag to the total retarding force would be that shown in Figure 3.

Speed And Friction

Except on icy surfaces, the coefficient of friction decreases as speed increases, the effect being particularly marked on wet surfaces.

This is because, as the speed increases, there is less time for the water between the tire and the runway surface to be squeezed out. Hence, a large proportion of the weight on the wheel is carried on a film of water. This

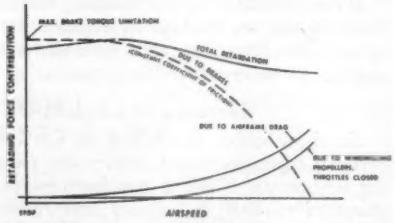


Fig. 3

can be reduced by grooves in the tire tread or a rough granular runway surface; or increased by presence of a grease exuded by certain runway material. Although attention is being given to improving adhesion through changes in tires and runway surfaces, it is doubtful that the effect of water can be entirely eliminated. In the case

of wet ice the coefficient of friction is almost constant, but on dry ice at temperatures near freezing, it may actually fall as speed is reduced and the ice has more time to melt under pressure of the tire.

Summary

The typical variation of retardation with speed which can be achieved on a landing is shown in Fig. 4. The broken line is the airborne portion from the threshold; the solid line is the ground portion. Important points to note are:

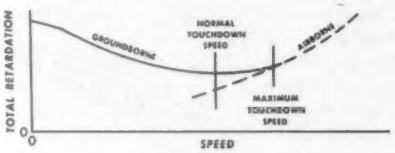


Fig. 4

a. If the airplane is held off the runway and touches down below the normal speed, there is a loss in retardation because airborne retardation is considerably slower than that which can be achieved on the ground.

b. Retardation which can be achieved at high speeds is appreciably smaller than at low speeds.

Recalling that the larger part of the landing distance is covered at high speeds, it follows from (b) that a small gain in retardation at touchdown speed, such as may be obtained by reducing to a minimum the period of hold-off and braking immediately on touchdown, can result in a substantial reduction in total landing distance and can be worth more than a large improvement in retardation at low speed.

Optimum Technique

In general, the best technique for stopping an airplane in the shortest distance is to touch down at the earliest practicable moment after crossing the threshold with as much weight as possible on the main wheels, and to apply maximum braking. This does not imply that the threshold should be crossed with less than a safe margin of height. If the airplane's characteristics permit its proper implementation, such a technique will give better results even on a slippery surface than reliance on aerodynamic braking down to a low touch-down speed or to a low nosewheel lowering speed. Although retardation from the wheel brakes is poor at high speeds, the increase over that obtainable with air drag alone is valuable. Where the airplane is fitted with reversible propellers or with props that produce high aerodynamic drag after touch-down, the importance of not delaying the touch-down is increased because these devices are most effective at high speeds. They should not be used before touch-down except in extreme emergency, and then with the greatest care.

Touch-Down Speed Limitations

For some airplanes the maximum touch-down speed is limited only by the time required to perform a safe flare-out. For others it may be limited by:

a. Tendency of the nosewheel, if it touches first, to cause the aircraft to balloon off the runway.

b. Need for some types of tail wheel aircraft to be touched down within a narrow range of altitudes if ballooning or porpoising is to be avoided.

Early Use Of Brakes

With non-automatic brakes, it is easy to blow a tire if the brakes are applied at high speed on a dry or patchy runway. On a really slippery runway, the risk of blowing a tire is small. Subject to maintaining directional control, on this type of surface, it is generally preferable to lock the wheels if there is any doubt about your ability to stop within the runway limits. Remember, the improvement in braking on an icy surface that has been sanded is less with a locked wheel than with a rolling wheel. The coefficient of friction is at its highest when the wheels are nearly but not quite locked, but it is impossible to maintain this condition with an ordinary braking system, and any attempt to do so may result in reduced braking efficiency.

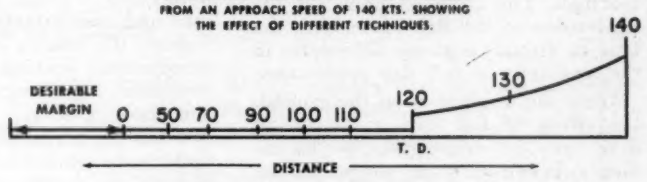
On some aircraft, the brakes tend to fade toward the end of a long landing run if they are used hard right from touchdown. For these aircraft optimum techniques must be established by experiment and from experience.

Wanting to avoid wear on brakes and tires will influence landing technique in day-to-day operations, but departures from the optimum technique for stopping in a short distance are only admissible if the distance available under the prevailing conditions is not critical.

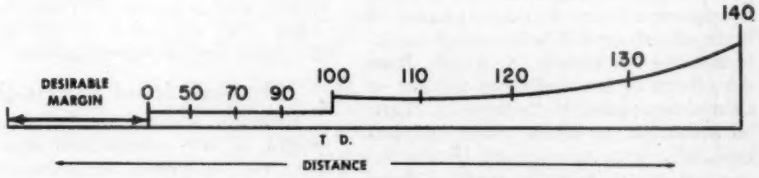
Increasing Weight On Wheels

For aircraft with soft nose wheel suspensions it is advantageous to push the control column forward as soon as the nose wheel is on the ground. This increases the weight on the wheels and also adds to directional control of the nose wheel which can be useful when landing crosswind on a slippery runway because it reduces the

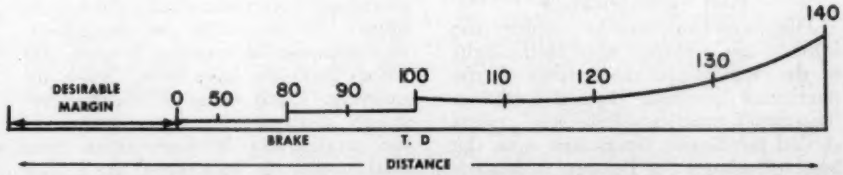
TOTAL LANDING DISTANCE OF A TYPICAL AIRPLANE FROM AN APPROACH SPEED OF 140 KTS. SHOWING THE EFFECT OF DIFFERENT TECHNIQUES.



TOUCH DOWN EARLY AND BRAKE EARLY



TOUCH DOWN LATE BUT BRAKE IMMEDIATELY



TOUCH DOWN LATE, HOLD NOSEWHEEL HIGH UNTIL 80 KNOTS THEN LOWER AND APPLY BRAKES.

need for differential braking which, in turn, reduces the total retardation available. The use of reverse pitch is an effective way of getting weight on the main wheels, even if only idling power is used. But once the props are in reverse, little is gained from using the elevators to put the weight on the main gear.

Tailwheel Aircraft

With some aircraft it is possible to apply brakes and keep the plane in an almost horizontal attitude without risk of bouncing or nosing over. By thus increasing the weight on the main wheels, such a technique usually results in a worthwhile reduction in landing distance and may also make the rudder more effective. However, the primary effect of getting more weight on the wheels may be offset by an inability to apply the brakes hard without risk of nosing over, and this should govern the extent to which this technique is used.

Use Of Wing Flaps

Unless overriding circumstances (unusual weather conditions or aircraft equipped with interconnection of throttles and flaps) make it unwise or impossible, full flap should be applied well before crossing the threshold. This permits a lower safe approach speed and reduces the amount of "float" if the energy at the threshold should be too high. The optimum point for the application of full flap varies with the type of aircraft and the differences in the sensitivity to full flap application.

Once the airplane is on the ground, the effect of full flap in increasing drag may be outweighed by its influence in reducing the weight on the wheels. With flaps giving high lift for small increases in drag in the take-off position, the gain possible through retraction may be slight inasmuch as, to satisfy conditions in other phases of flight, the drag will be removed quickly but the lift slowly. With split flaps the effects of lift and drag are not so clearly separated. With these, it migh be profitable to select "flaps up" immediately after touchdown IF the retraction speed is fast enough, if there are no inconvenient changes of trim, and no risk of raising the undercarriage by mistake.

Pilot Familiarization

Pilots are cautioned to consider the information provided here in the light of the handling characteristics of the particular airplane they are flying. Through practice landings, pilots should familiarize themselves with the best techniques for dealing with such emergencies as excess threshold speed and slippery runways. However, these practice landings should be confined to airports with adequate runways for such tests and in coordination with Air Traffic Control.

Non-Critical Conditions

The majority of landing accidents have occurred in conditions which, theoretically, were not critical even though gustiness, wet runways or poor visibility were factors in some cases. There is, however, evidence which suggests that lack of adherence to the best technique in non-critical conditions was an important factor in these accidents. This may be the result of pilots not appreciating the possible adverse effects of such conditions as wet runways.

In recent years none of the U. S. air carriers over-run accidents has occurred on a dry runway.

It should be borne in mind that a runway which is longer than the required minimum may prove inadequate if the correct technique is not employed.

As a good general rule, unless the runway is much longer than will be required, the plane should be handled at least to the point of touchdown as if the runway were critical. However, this does not imply that a reduction is acceptable in target threshold speed or height below the normal safe and comfortable minima. Figure 5 shows the penalty incurred by use of aerodynamic braking, i.e., holding the nosewheel high instead of lowering it and applying brakes. Although the use of a tail-down attitude to increase drag reduces the margin necessary for variation in the coefficient of friction, it also increases the margin needed for variation in threshold speed (since it lessens the ability to dispose of excess speed) and increases the basic distance. Thus, the combined effect increases the total field length required.

Threshold Speed And Height

Statistics suggest that the average height of the wheels and the speed over the threshold are some 20 feet and 23 knots above the power-off stalling speed in the final approach configuration. Wind, turbulence, handling characteristics, etc., may cause variations from these values. Pilot techniques represented by the above-mentioned threshold crossing heights and speeds probably have been chosen intuitively. Until there is further research and more becomes known of the relationship between safety and final approach technique, it is not possible to say whether the present pilot technique is, in fact, the safest for the currently available landing distances. However, there is evidence that techniques which produce threshold heights and speeds below 20 feet and stall-plus-23 knots are likely to result in undershoot or heavy landing accidents, particularly with larger aircraft.

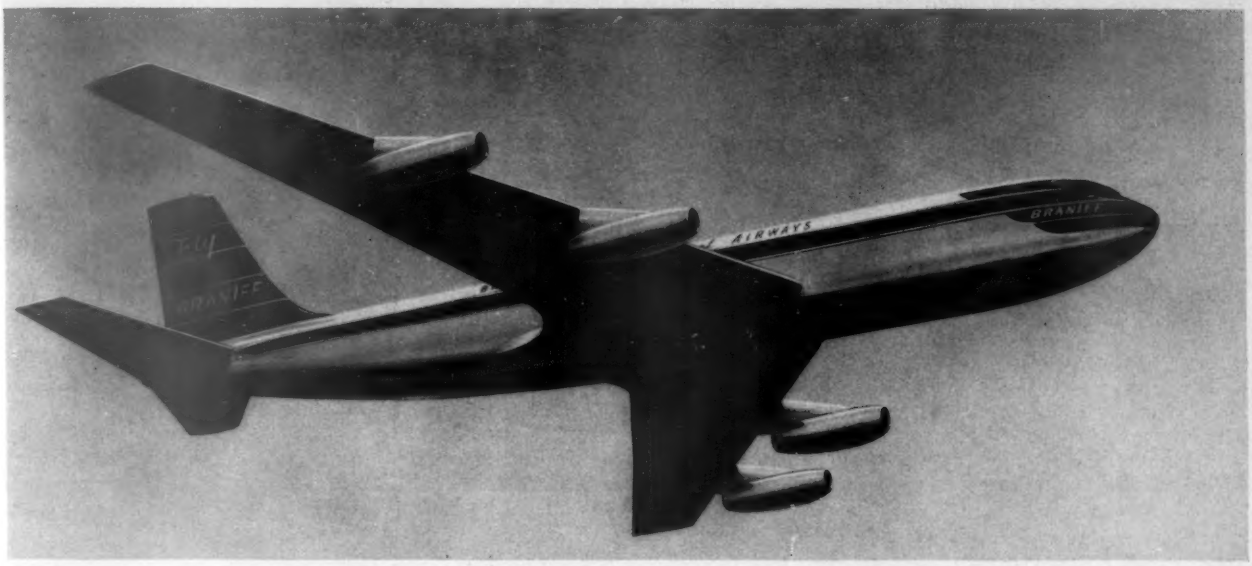
While assessing the optimum technique, bear in mind that increasing the threshold height has relatively little effect on landing distance required, provided the threshold is not crossed above the point from which use can be made safely before touchdown of all available aerodynamic drag.

In general, pilots do not vary their approach and threshold speeds with actual aircraft weight, but instead select those speeds appropriate to the aircraft's average landing weight. Where the landing weight is restricted to a value substantially below the average because of field length, it is advantageous to adjust the target speed accordingly. There is evidence, however, that in some cases, perhaps due to the use of constant approach power settings regardless of weight, the threshold speed is increased as weight is reduced. This can result in the airplane taking a longer distance to land at low weights than at high.

While the existing mandatory minimum landing distance requirements are suppose to provide for different surface conditions, this can only be achieved within limits. Therefore, the pilot must take special measures to ensure safety where extreme conditions are known to exist. If a flight is planned to an airport where wet ice conditions are apt to exist, an additional margin of distance above the mandatory minimum usually will be necessary if adequate safety is to be ensured. Similarly, when the runway surface is wet and only the mandatory minimum landing distance is available, it will be necessary for the pilot to abandon an attempt to land if his height and airspeed at the threshold are appreciably in excess of those intended. Remember that each knot of excess airspeed has, in the case of typical large piston-engined aircraft, about the same effect on landing distance as 10 feet of excess height. They both add about 1.8 per cent to the total landing distance.

Have You Moved?
In order to insure receiving The Air Line Pilot on time, notify us immediately of any change of address.

The Fact That Jets Are Not Complicated To Operate May Be Deceiving Because Of The Speed At Which Events May Occur And The Fast Reaction Time And Mental Alertness Required.



Physiological Considerations In The Operation Of Jets

By Dr. Charles I. Barron

The major physiological problems to be considered in the operation of jet and turboprop-powered transport aircraft are essentially similar in definition to those encountered in current reciprocating engine aircraft, but, varying in degree as dictated by the improved performance and mechanical characteristic of the newer aircraft. Of greatest importance will be the emphasis upon the rapidity with which events may be expected to occur. Basically, jet aircraft are simpler to operate and easier to fly, however, this may be somewhat deceiving in that events will occur twice as fast in jets and greater premium will be placed upon reaction time and mental alertness.

In analyzing recent mid-air collisions of high performance aircraft it is interesting to note that many of these accidents become inevitable not upon impact but as much as 5, 10, and 15 seconds before collision. It is apparent that the importance of time-distance-human reaction relationship had not been sufficiently emphasized or apparent to the flight crews. Regardless of the speed of aircraft, it requires a specific time interval to stimulate such sensory organs as the eye, ear, skin and muscles. If one transposes the distance covered by an aircraft during the time required for stimulation of sensory organ one cannot help but be impressed with the need for recognizing this changing and all important time-distance concept.

It may also be anticipated that decrements in physical performance and efficiency will occur more rapidly under stress conditions such as hypoxia associated with high altitude exposure. Minor imperfections in body physiology will also assume major importance.

Flight Profile

In considering physiological reactions in high performance aircraft one must define the probable flight profile of these aircraft. Future turbo-prop transports will fly at maximum altitudes of 25,000 to 35,000 feet, at speeds of 350-450 miles per hour and will have descent rates of approximately 5,000 feet a minute. Turbo-jet transports will fly at altitudes of 35,000 to 42,000 feet, at speeds of 500-625 miles per hour and will be capable of emergency descents of 10,000 to 15,000 feet a minute. The descent capabilities of the aircraft are stressed and their importance with relation to emergency descents following decompression will be elaborated upon later.

Under normal or usual conditions of flight a certain number of visual stresses may be anticipated. As one ascends to altitude there is an inversion of the brightness-illumination ratio, with a progressive loss of reflected light in the cockpit of an aircraft. Dependence upon instruments for data presentation will be far greater in high performance transports than at present. Consequently, the need for adequate cockpit and instrument illumination is emphasized.

Visual Glare

The problem of visual glare will increase with altitude. Discomfort may result from flooding of the eyeballs by reflected light from below and produce a veiling type of glare. Contrast glare caused by reflected light from the air-

The AL

Came

Things Are Comi

At left the new Douglas DC-8 and, right, the first Boeing 707 S off the production li . The Do shows the fuselage being lowere with the swept wing. he first D uled to be flown early ext year. mercial Boeing will be elivered t can World Airways is complet testing. It is schedule to go into in 1959.

Space Man

"Let's go up and look around for Sputniks," are Tom Corris' instructions to TWA Captain John Lien of Los Angeles, in the cockpit of an airliner at Midway Airport, Chicago. The 4-year-old wore a space suit and helmet and brought along his binoculars on a recent visit to the airport. Tommy is a son of John Corris, TWA's public relations manager in Chicago.

Ah, "Le

For good duty, it's difficult to beat "chores," of Bonanza crews based in Las es, Nev. Here they had a job transp g these Tropicana show girls to Los Angel nd return so they could make appearance s ules. The

ALPA

mera

gs Are Coming

w Douglas DC-8 gets wings, irst Boeing 707 Stratoliner rolls tion line. The Douglas picture lage being lowered for joining wing. The first DC-8 is sched- n early next year. The first com- will be delivered to Pan Ameri- rways on completion of flight heduled to go into service early

Ah, "Les Girls"

to beat "chores," in Las as, Nev. transp g these s Angel nd return rance s ules. The

Bonanza crew members are, from left: First Officer John W. Cook, Stewardess Vangie Casillas, and Captain Donald S. Gilday. Center is Charlie Baron, owner of the Tropicana.

Poor Mailman

Last month the millionth piece of mail in 1957 was sent out of ALPA home office. Here Scruggs Colvin, ALPA Administrator, hands the big letter to Joseph Kovach, mail room director at the ALPA home office. Before 1957 is over, it is estimated 1,250,000 pieces of mail will be postmarked in the Chicago office—an alltime record.

craft wings and metallic surfaces may result in decreased sensitivity of the eye to light, hence affect ones ability to see within the darkened recesses of a cockpit or cabin.

'Space Myopia'

Another interesting visual problem is that of so-called "space myopia." Ordinarily when gazing beyond 20 feet the visual axes are parallel and the sighting distance of the eyes are infinite. This insures maximum range in visual detection of aircraft and/or obstructions in the flight pattern of an aircraft. To achieve this ideal condition, visual fixation upon an object such as clouds or the horizon is necessary. At an altitude of 40,000 feet where background reference is entirely lost, the visual axes tend to fix at a point approximately 3½ feet in front of the eyes. This tends to reduce the visual sighting distance by 50 per cent.

Finally, so-called physiological lag time must be emphasized. In order to see an object, the retina, or photo portion of the eye, must be stimulated. Under average conditions it requires 1/10 of a second for this reaction of perception. An aircraft traveling 600 miles per hour will, therefore, traverse a distance of approximately 85 feet before the pilot can perceive an object in his flight pattern. To project this to total reaction time involving perception, understanding of problem, decision to act and the necessary movements of the body, plus the mechanical lag in aircraft cables, it must be assumed that approximately 10-12 seconds, 1.6 to 2 miles, will transpire prior to any affective action in changing the flight course of a rapidly traveling aircraft. Under these conditions it is understandable that mid-air collisions, inability to pull out of a dive and unsuccessful low altitude escapes frequently occur with disastrous results.

Noise Exposure

Another major physiological problem assuming increasing importance in performance aircraft is that of noise exposure. *Overall* noise levels produced by jet and turbo-prop engines are considerably higher than that of their reciprocating counterparts. In reciprocating engines the major source of noise is the propeller tips flayling through the air. Because of its high propeller tip speed, turbo-prop engines product somewhat higher noise levels than corresponding reciprocating engines and exposes maintenance personnel to more consistently high noise energy. Idle-RPM in the turbo-prop is approximately 90 per cent of maximum RPM, thus accounting for the consistently sustained high noise exposure during test runs.

Turbo-jet engines are capable of producing noise levels sufficiently high to cause extreme annoyance, pain and in some cases, rapid damage to the unprotected ears. In addition to auditory discomfort, noise energy in the range produced by some turbine engines is of sufficient intensity to produce significant non-auditory complaints such as nausea, muscular incoordination and blurring of vision.

The noise spectrum of a turbo-jet engine reveals relatively high intensities in the lower frequencies. The pure jet engine produces its highest peak energies in the range of 300 to 1,200 cycles per second. The jet engine more effectively tends to mask conversation in the important speech frequencies and is also potentially capable of damaging the most sensitive portions of the hearing nerve. The compressor of the jet engine produces a whine or siren noise which is especially annoying to the sensitive middle frequencies of the hearing nerve. The tailpipe is the chief noise contributor with the engine operating at maximum RPM on the ground.

Different Distributions

The noise distribution in the cockpit or cabin of the jet aircraft will vary somewhat from its contemporary. In a propeller type aircraft noise levels are greatest in the immediate vicinity of the propeller tips. Vibrations are most severe opposite the insertion of the wing root through which they are transmitted directly to the fuselage frame In the jet transport maximum noise in the aircraft will occur in direct relationship to the tailpipe radiation pattern and will be minimal in the cockpit area. Installation of the jet engines at a distance from the fuselage will also minimize internal noise levels. Since the jet engine has fewer movable parts, less vibration will be transmitted to the body frame, consequently minimal disturbance will be experienced by the flight crew and passengers.

Increased emphasis on noise control in hearing conservation programs is inevitable in the near future. Some practical solutions have been effected by the development of remote control trimming equipment, the use of noise attenuating devices that fasten directly to jet engine exhaust stacks during ground testing and the use of more efficient ear protective devices such as earmuffs. Communication under these conditions is a serious problem and will require the use of well constructed electronic communication systems and/or non-auditory means of communication for ground crews.

Adverse Community Reaction

Some adverse community reaction may also be anticipated. Alterations in flight patterns and power settings and other technical expedients may minimize these complaints. Proper indoctrination of the local citizenry into the necessity for military aircraft operations will be needed. Such an indoctrination program was effectively carried out by Colonel Shoup at Truax Field, Madison, Wisconsin, and may be duplicated at other military installations.

Much information and considerable misinformation has appeared in the literature concerning the effects of microwave radiation (radar) upon animals and humans. It is possible, under certain conditions, to expose anesthetized animals to high powered microwave emanations and produce pathological changes and even death by excessive elevation of body heat. Fortunately humans have a much more efficient heat regulatory mechanism than animals, and do not react in quite the same fashion to radar beam radiation.

Emphasis On Radar

There will be increased emphasis on the use of radar and other electronic equipment in future transport aircraft. Crew personnel in these aircraft are generally protected from the effects of the firing beam by adequate structural shielding. Ground test personnel may, however, be exposed to the direct effects of the firing beam during ground testing of the equipment. Under these circumstances caution must be observed in approaching the near vicinity of the firing antenna. While there is no definite current evidence that any human being has sustained damage as a result of microwave exposure, the equipment must be treated with respect. There undoubtedly will be specific directives concerning test procedures and zones in which exposure time will be carefully defined.

The firing radar beam does, however, raise a ground safety problem in that the beam under certain conditions is capable of igniting inflammable mixtures, firing photo flash bulbs and producing other potentially undesirable ground effects. Here again zones must be defined and inflammable material

(Continued on Page 20)

CAA Reports: Air Traffic Still Going Up

In the first annual report of the CAA's Air Traffic Control department, D. D. Thomas, director, points out many significant gains in controlled use of the airways.

ATC has been operated as a separate section of the CAA for little more than a year now and many of its procedures reflect a trend paralleling recommendations of the ALPA committee on air traffic control.

Figures Presented

Thomas presented figures to show the extent of the rapid expansion of ATC activity, and he said "the demands for ATC services is increasing at an explosive rate."

His figures in comparing fiscal 1956 with 1957 are:

	1956	1957	Per cent Increase
Aircraft Contacted	7,655,180	8,792,734	15
Aircraft Operations	20,383,867	23,728,374	16
Fix Postings	22,890,158	27,987,192	22
Instrument Approaches	712,050	1,048,894	47
IFR Peak Day Departures	14,700	17,266	17

"Past traffic trends point to accelerating future demands for ATC services," said Thomas, "and the fiscal year 1957 IFR air traffic level is proof-positive of expanded system capacity due to the beginning of the implementation of programs sets forth in the Federal Airway Plan."

The growth of air traffic requires that the whole ATC organization expand and work at top speed if it is to provide the traffic control capacity required, Thomas pointed out.

Need More Capacity

"As of now, our customers could use more and more capacity, especially in the air traffic hubs," he declared. "As soon as capacity becomes available, pent-up demand moves in and occupies it."

Describing the expanding ATC facilities, Thomas said that in the last year increased manpower was one of the two keys that "opened the door to increased system capacity."

"This didn't just happen," he said, but was the result of an air traffic control training program of a size and scope never before attempted by the CAA or its predecessor organizations during a peacetime or national emergency period.

Approximately 1,400 new personnel were recruited and given basic air traffic control training at the Aeronautical Center in Oklahoma City, and about 800 additional new personnel were recruited and assigned to field facilities for on-the-job training.

Additionally, some 3,000 personnel were administered advanced air traffic control training at field facilities.

To accelerate the training program, Thomas said the ATC is making widespread use of various types of ATC simulators, as well as visual-aid equipment. Flight progress simulator boards, small and large navigation training computers, tape recorders, radar simulators, sound projectors, magnetic blackboards and ATC training slides and films are being distributed to more than 61 ATC facilities.

Radar Procedures

"An expanded and comprehensive training program in radar procedures has been included in the modified ATC training program which was implemented last July 1," he explained. "This program calls for procurement of some 63 6-target electronic radar training simulators at ATC centers and towers to provide training to controller personnel."

Expansion of the ATC system capacity at a fast pace has been due to "the all-out efforts of the Office of Air Navigation facilities to implement our plans to do a bigger and better air traffic control job," Thomas maintained.

He told how plans for control of all air space above 15,000 feet were developed within the last year (an ALPA ATC committee recommendation) and should become effective about next April 1.

"This program required the establishment of 375 direct controller-pilot communication channels as well as some 14,000 files of new interphone circuits," Thomas said. "More will be needed as operational deficiencies develop."

Thomas disclosed that action is underway to expand the use of long range radar to cover a total of 27 locations. First equipment of the expanded program is scheduled to be delivered to Washington this December.

Ten additional long range radars will be added to the system in the 1958 fiscal year.

Plans for Future

"In future years our plans are to provide extended terminal area coverage at all major terminals," he said. "These will cover high density airways down to approximately the minimum operating altitude and will cover all airspace above 15,000 feet within the continental limits of the United States in order to provide improved control of air traffic at high altitudes."

Thomas reported that excellent results have been achieved during the last year through the use of an electronic computer and associated equipment installed at Indianapolis to process flight data, calculate flight times and produce printed flight progress strips for air traffic control displays.

Two additional computers will be installed in New York and Washington ATC centers.

These computers will prepare flight progress strips at high speed and will automatically exchange flight data between the New York and Washington centers and the Washington and Indianapolis centers.

Planning Standard

"A continuing expansion of this program is planned for succeeding fiscal years until all centers are equipped for computer processing flight data," Thomas said.

The ATC has developed a planning standard governing the provision of flight assistance service to all classes of aircraft and to revise Airway Planning Standard No. 1, to reflect changes in operational procedures.

In his report, Thomas said he wished he could say ATC is "over the hump," in its service, "but our job to increase capacity has scarcely started."

Along the Line . . .

Flying's His Business, Art His Hobby

Pilot-Artist Halperin

From His Brushes Flow Impressions of Aviation's Sounds, Motions And Sensations

It has been said that among the ranks of air line pilots you will find almost any talent and a range of interest almost as broad as the numerical membership of ALPA. A case in point is artist-pilot Dave Halperin, who is also ALPA Region IV vice-president.

Captain Halperin's vivid imagination and ability to transmit the wonders of the air and the airplane onto canvas in superb impressionistic style are well demonstrated by these three samples of his work even though much of their depth and dimension are lost in black and white reproduction.

Halperin has entitled these works "Transonics" (upper left), "Approach Coupler" (above), and "Thirteen Thousand Horsepower at 2900 RPM" (left), all of which shows how well Capt. Halperin expresses his aviation interest with that of his art.

In "Transonics," the artist holds that "there is a world of reality that exists only in illusion. This illusion is abstraction.

"There is no question of the existence of temperature, motion, turbulence, shock, or vibration. These phenomena are known through experience and an understanding of the physical factors involved.

"Visual reality, in its simplest form, is the limited view from the human eye in its everyday experience. Vision must be more than the ability to see imperfectly.

(Continued on Page 20)

The Cockpit Viewpoint

An Air Line Pilot Views Pilot Training

Training, Says The Author, Prevents Personal Obsolescence. To Be Able To Do A Safe, Efficient Job, The Air Line Pilot Should Have Access To Every Practical Aid

By E. R. Watson
EAL

Interest in training requirements for the air line pilots is increasing and must continue to do so because of the rapid growth of the industry and the introduction of radically new equipment.

One of the large trunk carriers will increase its fleet ten times over during the fifteen year period between 1945 and 1960. This growth will take us from the DC-3 era into the jet age.

Evidence of this increased interest can be found in the realization by some carriers of a need for well planned and well organized training programs.

ALPA On Project

The Air Line Pilots Association has embarked on an ambitious study of training with the appointment of a Training Study Committee to formulate a detailed ground and air training curriculum for all pilots on all types of equipment. This is quite an undertaking.

Many pilots are realizing the need for more knowledge in aerodynamics, meteorology, electronics, and the gas turbine engine.

Training is the means by which we progress, and continuing study wards off personal obsolescence. Training of the air line pilots is basically an economic consideration. No compromise should be made in standards of proficiency, for in the long run, dilution of training standards is uneconomical. With one single unit of equipment costing several millions of dollars, safe and efficient operation of this unit is the carriers' primary consideration. The pilot, as the operator of this equipment, should have available to him every practical aid to enable him to do a safe and efficient job.

Training Differences

Progression of a pilot from one type of equipment to another and from the right seat to the left seat is accomplished in as many different ways as there are scheduled carriers. The type of operations conducted by the carrier dictates its training program. Rapid expansion creates tremendous problems in training new pilots and up-grading many others all the way down the line.

The purpose of this article is to evaluate realistically the training picture as it applies to the larger carriers and in the light of practical day-to-day operations. If we were all still flying the DC-3's, then this subject would not arise for discussion.

To begin historically, training was a comparatively simple function not too many years ago. A carrier usually operated one type of equipment, and a newly hired pilot was given a few rides around the field and then turned over to the line captains. I am sure many of us learned just that way. The experienced line captains accepted this responsibility as part of their job.

Today the responsibility for training the new pilot is still largely on the line captain.

Actual manipulation of the controls on the job is still the only way to learn to fly and become familiar with the routes and operating procedures. The extent of the responsibility placed upon the captain depends on the various carriers' hiring requirements and the quality of their initial training programs.

Yes, training becomes a consideration even as initial hiring requirements are set down. If minimum qualifications are set down, then the carriers' responsibility becomes greater to qualify the man before he climbs into the right seat of a passenger carrying aircraft. This responsibility is clearly stated in Civil Air Regulation 40.280.

Less Qualified Pilots

Availability of military trained pilots after World War II allowed hiring qualifications to be set high. As this reservoir has all but dried up, qualifications are now the lowest in many years.

The transition from a total experience of four or five hundred hours of light aircraft time, accumulated in a local area, into a Martin 404 or Convair 440, operating on congested airways, is a gigantic step. Every practical means must be taken by the carriers to make this transition safely and efficiently.

A minimum of eight hours initial dual training in these pressurized, high wing loaded, fast aircraft is necessary for the new pilot. More time should be given if the individual case warrants. Observation rides by the new pilot over the carriers' routes are also very helpful. The new pilot can assist the more experienced co-pilot whenever practical in making radio contacts, and calculating estimates, etc.

These observation rides are very practical in getting the new pilot familiar with his new working environment. Patience and caution must be exercised by the line captain in helping his new colleague get off to a good start.

Need Line Instructors

The use of line instructors, whose duties would be to introduce the new pilot to practical everyday operation, is highly recommended.

About The Article —

This is a Safety Forum Report on Pilot Training delivered at the Fifth Forum. Since then, an Association Pilot Training Plans Committee, established by resolution of the Board of Directors at the 14th Convention "to study and formulate a detailed ground and air training curriculum for all pilots on all types of equipment" has been set up. It is composed of: Ed Watson, the author, EAL, Chairman; Steve Gondek, Mohawk, and Don Leonard, NWA. Their final report will be submitted to the Board of Directors for its approval. At the present time, the Committee has drafted its preliminary report, which is being distributed for comment, prior to writing of the final report for submission to the Board of Directors for final action.

Training of an air line pilot is a continuing process. In many cases, our new pilot no sooner becomes comfortable on his local twin engine run then he is back in school for check-out on the heavier four engine equipment. From this point on the training picture becomes complicated; complicated by the variety of equipment flown by the carriers.

Some carriers have several models of Douglas equipment. Some, several models of Lockheed equipment. Some have an assortment of both Douglas and Lockheed equipment. Interchange of equipment further complicates the picture.

Cost of operation of the heavier air craft tends to keep training to the minimum. Thus, the pilot coming up for this training is frequently given only the minimum time in the aircraft, and again the burden is placed on the line captain for transitioning the pilot.

We now come to the pilot, who, after ten years in some cases, is being up-graded or promoted to captain. After eight or ten years, the only problem confronting this gentleman is to get accustomed once again to the local type operation versus the long haul non-stop operation he flew as a senior co-pilot.

The most helpful means of re-orientation in this case is to allow this pilot to return to the local operation for a month or two and on-the-job refresher under the guidance of one of his colleagues flying this type run.

IFR Checks

Recurrent training for the experienced pilot is another evasive problem. The six month instrument check is not an end in itself, but merely a measure of the sufficiency of a training program. The increased speed of modern aircraft, plus the complicating factors of staying adequately qualified in both the equipment and operations procedures, has greatly reduced the time free from duty available to the pilot.

The continuing insistence of the operators that many of the so-called "refresher" programs be conducted as "no cost" items constitutes an encroachment on his already meager "time off," and creates a serious resistance among the pilot group which will only be corrected with adequate recognition and evaluation of this basic factor.

Other industries have recognized the need for training their personnel with the establishment of training centers. In today's fast moving technological age it is just plain good business.

For a pilot to know every component and function of all accessory systems on the aircraft would require his every spare minute out of the cockpit. To require him to be an electronics expert, a hydraulics specialist and an engine diagnostician, added to his normal flight duties, would be most unrealistic.

In most cases detailed knowledge of the aircraft systems is little value since, fortunately, the systems are designed to fail safe during flight. Aside from replacing a fuse or rendering the failed equipment inoperative and then selecting the alternate system, little can be done in flight. On the ground there are usually qualified specialists to remedy the mechanical trouble.

Urges Get Togethers

One of the most productive means of recurrent training for experienced and mature pilots is organized discussion of everyday operational problems.

Not too many years ago most operational problems were circulated by way of the grapevine and discussed in the hotel lobbies. Now, with some seniority lists containing fifteen hundred or more pilots, a great need exists for an exchange of information. Many operational incidents, if freely discussed among the pilots, would add to everyone's ability to do a better job.

Most pilots are little concerned with the type magneto installed, or the serial number of prop blades, or the pressure in the tires. As long as these items function properly and receive the necessary checks and maintenance, the pilot gives them little thought.

The pilot is, however, greatly concerned with the quality of his navigational aids and flight instruments. Change his instrument grouping or alter his radio equipment and he becomes more than inquisitive. The pilot's knowledge of the aircraft systems should, however, be sufficient to permit him to neutralize a failed system and select the proper alternate.

Emergencies

Emergency procedures should be stressed in all phases of training. The increased use of the flight simulator is a big step forward in the presentation of emergencies. While it is recognized the simulator is not a replacement for actual flight training, it is a valuable supplemental aid, especially in offering safe practice in emergency procedures that could not be accomplished safely in the aircraft.

Simulators permit more effective utilization of the pilots' training time since there are no weather delays or time lost waiting for an aircraft. Economics will also favor the increased use of simulators, since the hourly operational cost of aircraft is becoming high, making their use in training limited.

From a pilot's point of view, the importance of, and the stress placed on the various phases of training should follow in this order:

1. Performance of the aircraft.

This is the pilot's first concern and, of course, requires actual flight training to become familiar with the handling characteristics of the aircraft. Performance information and knowledge will become increasingly important in the turbo prop and jet aircraft, where such items as temperature accountability on take-off and fuel consumption versus altitude will be major considerations.

2. Emergency procedures.

As long as we move about in these vehicles, systems and engines are going to fail. The pilot's knowledge of the engines and systems must be sufficient to permit him to intelligently render the failed system inoperative, take necessary precautionary steps to prevent progression of the failure, and select the correct alternate systems.

3. Complete understanding of the use and limitations of his flight instruments and radio aids and communications.

Since these are the pilot's most important tools, whereby he gets the aircraft from A to B, any changes in type of flight instruments or re-arrangement of the grouping should be done only after careful examination. Standardization of instrumentation and radio installations should be accomplished at least within the fleet of each carrier.

4. Additional information on the aircraft systems and structure which is understood by the pilot and may be found for ready reference in manuals aboard the aircraft.

In the industry there are examples of the two extremes in training. Some carriers utilize all the latest training devices and require frequent attendance in ground school; other carriers satisfy the minimum requirements only, and assume the individual pilot keeps current on his own initiative.

A comparison of the accident rate of the two philosophies is not an accurate gauge, since many other factors enter the accident picture such as terrain, maintenance, weather, etc. It is difficult to find any one factor to measure the quality of a carrier training program.

As to the future, it is gratifying to learn that much preplanning is in progress by the manufacturers of new aircraft to present a suggested training curriculum well in advance of aircraft delivery. The carriers have only to present this information to the pilots, with perhaps, minor adjustments to suit each carrier's needs.

As one begins to examine the subject of the training requirements for air line pilots, many questions arise which do not have ready answers.

Some of these questions, which I would like to direct to the ALPA Training Study Committee for their future consideration, are as follows:

1. How much should the pilots participate in setting up their own training programs? The pilots of one carrier approved every maneuver used in the simulator.

2. How is the quality of a training program measured? Perhaps, by the performance displayed on the six month instrument check.

3. How long can the carriers set minimum requirements for initial hiring? The day may come when the carriers will have to supply even the basic flight training.

4. The use of professional instructors versus instructors from the line. Will the professional instructor have the practical line pilot's viewpoint?

5. What type of training aids are most desirable? The cockpit procedures trainer, which is a mock-up of the cockpit, could be used where the cost of a simulator is prohibited.

6. On how many different types of equipment can a pilot keep safely qualified?

7. How much co-pilot on-the-job training can the captain be burdened with? Should the captain split the flying on a 50-50 basis, including low ceiling and low visibility approaches?

8. How often should recurrent emergency traning be given, and what should it include? Civil Air Regulations do not specify frequency of emergency training.

9. Can visual aids, in the form of emergency evacuation charts and emergency equipment location, be placed in crew ready rooms for constant emergency training without creating apprehension?

10. How can operational incidents of an educational value be circulated among the pilot group? Incidents such as: near misses, unusual weather ex-

(Continued on Page 20)

For Wheels Up Landing, Commendations

The Crew Of An UAL DC-7 Pose Alongside Their Plane After Making A Successful Belly Landing In Los Angeles When Plane's Gear Jammed. From Left, M. W. Fraim, Flight Engineer; C. C. Dent, Captain, And F. M. Nizich, Copilot.

The belly landing of a UAL DC-7 at Los Angeles International Oct. 31, after the main gear jammed has won commendations for its crew.

Members of the crew were Capt. C. C. Dent, pilot; F. M. Nizich, copilot, and M. W. Fraim, flight engineer.

Clarence M. Sayen, president of ALPA, wrote a letter of commendation to the crew. It reads:

"We have recently been informed of the responsible manner in which you conducted yourself during the emergency situation which developed on your flight of October 31, due to your inability to extend the landing gear at the end of your flight.

"All information indicates that you and your crew dealt with this emergency in a most commendable manner. Such actions demonstrate excellent technical skill, judgment, and emotional control of the type expected in our profession. Your ability to meet these standards under most trying conditions is a credit to the air line piloting profession and the entire air line industry.

"May we extend our personal congratulations on a job well done."

Capt. Al Schmidt, chairman of UAL ALPA Council 57, wired ALPA headquarters the following:

"Commendable job done by Capt. Charlie Dent, Flight Officers F. M. Nizich, and Flight Engineer M. W. Fraim, and stewardesses on emergency landing at Los Angeles. Highest praise, prior, during, and after emergency a credit to the airline industry."

(Continued on Page 20)

Firemen At Los Angeles International Stand By For Possible Fire After Landing. Damage To Plane Was Not Extensive. One Thousand Feet Of Foamite Was Spread On The Runway Before The Landing Was Made.

Pilot Training . . .

(Continued from Page 19)

periences, hazardous conditions around airports, maintenance items, ATC items, accidents, etc.

11. Are line checks as required in the CAR 40.302, of any real value?

In summary, to repeat, the basic reasons for interest in training are safety and economy of operation.

The manufacturer is interested in training because he wants his customers' personnel to be familiar with the maintenance and operation of the aircraft so that the unit may go into service with the minimum of effort.

The carriers should be interested in training so that its personnel can maintain and operate the aircraft for maximum utilization.

The personnel operating the equipment should be interested in training in order to do a safe and efficient job.

The government regulatory agencies should be interested in training to insure the safest operation for the traveling public.

Thus, training is the concern of everyone in the industry, and cooperation between the groups most concerned (the manufacturer, the carriers, the pilots, and the government regulatory agencies), is desirable.

The carriers must bear the responsibility of adequately training the pilots, and the pilots must be ready to accept new training and new concepts.

Pilot Artist . . .

(Continued from Page 16)

"The eye is an instrument of the mind; and if the mind probes the why and how of motion, and seeks and investigates beyond the immediate ken, should not the artist venture out into the same unknown to probe visual experience?

"In this picture I am insisting that a form, color, and space relationship be accorded to movement through the sound barrier—the transonic range of motion."

Halperin captures the mechanical side of aviation in his "Approach Coupler." About this painting he says:

"The elements of the electronic circuited approach coupler are here imagined. The so-called 'black boxes,' replete with magical impulses activating solenoids, transmitters, synchronous motors, and other assorted wizardry.

"Here too, is the ever present Sine wave, the pulsating heartbeat of A.C. —the oscillation now dampened, now amplified, and now distorted.

"All this is designed to produce mechanical approaches through ceilings of wraith-like cloud and forming fog."

The sensations of take off form themselves in contrasting fashion for Halperin in "Thirteen Thousand Horsepower at 2900 RPM." He says:

"In the movement down the runway of our most powerful propeller-driven aircraft, there is a tremendous interplay of motion—complex, and somewhat terrifying.

"Power is produced linearly, converted to rotary, absorbed by the arc of the propellers, and is dissipated in tornado-like spirals which are blotted to insignificance like eddies on a pond.

"There, too, is the spinning of wheels gently tucking away—and over everything the vibrations in sound and sense of thirteen thousand horsepower at twenty-nine hundred revolutions per minute."

Halperin, 42, is studying for a Bachelor of Fine Arts degree at the Kansas City Art Institute, and he has had showings in several exhibitions. He lives in Shawnee, Kansas.

Emergency Landing . .

(Continued from Page 19)

The landing was made after a night nonstop flight from New York City and with the crew trying for two and one-half hours to extend the gear, they were in the air for 11 hours. There were 16 passengers aboard.

Indications were that the emergency resulted from mechanical failure in the right main gear. The doors only opened slightly and the wheel was extended only about a foot. The only major damage sustained in the landing was to the props.

Physiological Jet Considerations . . .

(Continued from Page 14)

eliminated from exposure while the radar equipment is being used.

Cabin Contamination

Attempts have been made to use engine bleed air for pressurization and air conditioning in large turbine-driven bombers and transports. At irregular intervals in some aircraft, cabin contamination with smoke and haze has been encountered. The contaminants represent formulations produced by thermal decomposition of lubricating oils coming into contact with hot engine parts, generally in the compressor and it is felt that leaky bearing seals allow lubricating oil to escape into the compressor section.

In high performance aircraft compressor temperatures may exceed 700° F., thus necessitating the use of synthetic based lubricating oils for greater thermal stability. Thermal decomposition of these oils result in the formulation of esters of the various component acids such Adipic, Sebacic and Pelargonic. Under experimental conditions high concentrations of these acids have proved biologically detrimental to animals. Fortunately no such concentrations have ever been detected in contaminated aircraft cabins. Smoke and haze, however, are undesirable in any aircraft since they produce irritation to the eyes and throat, adversely affect visibility and crew morale, and also hasten deterioration of aircraft parts. This condition has been controlled by the use of catalyic or oxidizing filters in some cases. It is, however, probable that in transport-type aircraft independent compressors will be installed and fresh air used for air conditioning and pressurization. The compressors will be driven by air.

Rigid Decompression

Perhaps the most important consideration in the operation of high altitude aircraft is the possibility of a rigid decompression with loss of cabin pressurization and subsequent exposure to the ambient flight pressure.

There are a number of variables that will influence the possible physiological effects of a rapid decompression. First the rapidity of decompression. It must be emphasized that all transport-type aircraft will be so constructed as to minimize the possibility of high altitude decompression. Should it occur, however, it will most likely involve the loss of a window, windshield, door or hatch. In the event of such a decompression it is unlikely that the ambient flight altitude will be reached in the cabin of the aircraft in less than 15 seconds, or in more than 45 seconds. During this period of time the aircraft will probably begin its descent. To prevent such decompression and/or decrease the rapidity of decompression, potential openings will be

small. Windows will be double paned and of unusual strength; doors and hatches will open inward and will be of the plug type.

Most transport aircraft will have multiple out-flow valves, any one of which will maintain proper pressurization. In the event of complete and total failure of the valves, manual means of maintaining pressurization will be available.

In most single-engine aircraft, decompression occurs as a result of engine failure or flameout. Under this condition the time of decompression, even in a small aircraft, is usually long. In transport type aircraft it is inconceivable that multi-engine and total compressor failure will occur. Ram compression and continued windmilling of the compressor will have some tendency to counteract the complete loss of engines.

An explosive or instantaneous type decompression is very unlikely to occur in a transport-type aircraft. These aircraft will be so substantially constructed that structural failure such as occurred in the Comet will undoubtedly result in total loss of the aircraft. For this reason every precaution will be taken to engineer the possibility of structural failure out of the frame of the aircraft.

In addition to the rapidity of decompression, the ambient altitude to which the cabin is eventually decompressed is also significant. Experiences in military decompressions have shown that 30,000 feet represents a critical altitude above which the duration of consciousness time without oxygen following decompression will not exceed 15 seconds.

Duration Of Altitude

The duration at altitude is another important variable. It is assumed that an aircraft will not descend immediately after decompression and that it will require at least 10 to 12 seconds for the pilot to act after awareness of the emergency. In the majority of instances it is doubtful whether the aircraft will start its descent in less than 30 seconds, as pilots will desire to assess the flight capabilities of the aircraft before starting a descent. The duration at altitude in decompressions about 30,000 feet will be extremely important in determining the ultimate effects of oxygen lack upon crew and performance.

Rapidity Of Descent

Finally, the rapidity of descent is extremely significant. It is possible under certain conditions to descend sufficiently fast to beat the symptoms of oxygen lack, or hypoxia, and certainly to prevent unconsciousness and critical body damage.

It has been our experience in indoctrinating flight personnel that subjects in moderately good health decompressed to 25,000 feet in 7/10 of a second do not necessarily require supplementary oxygen to prevent symptoms of hypoxia, providing the duration at altitude does not exceed 30 seconds and descent of at least 3,000 feet a minute is effected. This also assumes that the subjects are seated at rest and are aware of the impending decompression. In transport type decompressions of critical magnitude it may be expected that the passengers will exhibit apprehension and may not necessarily be at complete rest. It is again emphasized that crew members should be required to use oxygen at any time the pressure or physiological altitude exceeds 10,000 feet.

Effects Of Hypoxia

It is generally believed that personnel exposed to the effects of hypoxia at 30,000 feet will have one to two minutes of useful consciousness. These figures have been obtained by pressure chamber experiments, using healthy subjects at rest and under controlled test conditions. *Actual experience in aircraft decompressions,* however, have shown that it is *extremely doubtful* whether any subjects decompressed to altitudes in excess of 30,000 feet will have more than *15 seconds* of useful consciousness. In every known decompression above this altitude, personnel not having oxygen immediately available and wearing a mask secured to their helmet at the time of decompression have been unable to maintain consciousness. In some of these cases the oxygen mask was hanging from the side of the helmet and had merely to be secured to the opposite side. In other instances the oxygen mask has been lost due to air blast. *It is apparent that in any aircraft flying above 30,000, and preferable 25,000 feet, air crewmen responsible for control of the aircraft must be required to wear oxygen masks in the secured position.* This does not necessarily imply that the crewmen should be breathing oxygen whenever the cabin altitude is less than 10,000 feet. Automatic oxygen flow-initiating equipment will be installed in some transports. This provides for immediate flow of oxygen in the event of cabin pressure loss. It must be impressed upon all crew members that the wearing of oxygen equipment is absolutely essential at these altitudes. The rapid onset of hypoxia following decompression and/or physical activity should be emphasized and re-emphasized and all available statistics utilized to stress this most important dictum. Oxygen discipline must be enforced to prevent serious consequences in the aftermath of high altitude decompressions.

The problem of decompression in military air transports is compounded by the type of personnel generally transported. The majority of studies on decompressions above 25,000 feet have been on subjects in good health. It is conceivable that transport aircraft will carry passengers who are very young or in marginal physical condition. The effects of decompression upon these subjects as well as air evacuation patients is more difficult to assess. It will obviously be desirable and necessary in some cases to rapidly administer oxygen to passengers. Considerable studies have been effected in this field by various civilian agencies, aircraft manufacturers and the Civil Aeronautics Administration. Recent studies by the last organization have revealed that a majority of representative civilian personnel can apply an oxygen mask to their face in an average of 4 seconds provided the mask is made immediately available and is of a self-adhering cone type with a universal fit.

Quantity Of Oxygen

A major point of controversy at present centers around the quantity of oxygen to be carried by transport aircraft. Range of flight in high performance aircraft is a function of speed, which in turn depends upon altitude, fuel consumption and other variables. It is obvious that in order to achieve speed and range, an aircraft cannot carry excessive non-functional weight as might be necessary to supply all passengers with oxygen for the major portion of a flight.

Another problem of major concern in aircraft decompression is the possible effects of internal trapped gas expansion. Theoretically, gases within the lungs, gastro-intestinal tract, sinuses and middle ear will expand rapidly to conform with the drop of ambient pressure. It is not anticipated, however, that any detrimental effects will be experienced. In relatively slow transport decompressions, the average healthy individual can tolerate almost any volume of internal gas expansion provided the decompression is prolonged over a period of not less than 3 seconds and the lung passages are open. Potentially damaging internal pressures and gas expansion occur when the decompression time is less than 1 second.

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As stated previously, decompressions of the latter magnitude will not occur in transport-type aircraft short of destruction of the aircraft itself.

The majority of fatalities resulting from past commercial aircraft decompression have occurred as a result of airblast and loss of subjects. Studies performed several years ago by the Civil Aeronautics Administration have revealed that in aircraft with pressure differentials of 2 to 7.5 psi and potential openings of 8" to 14", air blast will result in the loss of unrestrained personnel positioned less than 7" in front of the window or 15" to the side of the openings. Subjects secured with a lap belt may forcibly be thrown against the window casing and sustain critical injuries. Increasing the size of the opening and/or increasing the pressure differential will result in a greater blast effect. It is apparent that adequate restraints such as shoulder harness and lap belt will be necessary for crew personnel exposed to air blast of high magnitude, and that other equipment such as protective nets may be necessary to cover large openings.

Fogging

A common complaint of flight personnel undergoing decompression is the presence of fogging and dust particles obscuring vision for 10 or more seconds. Fogging will occur when the temperature drops and the dew point is reached. The fog will disappear, however, but vision obscuring dust may persist. Good house keeping and aircraft cleanliness is essential.

Occupants of an aircraft following decompression will be exposed to extremely cold temperatures. The air temperature at 35,000 feet and above is a minus 55 degrees centigrade. The cooling effect upon the occupants of the aircraft will depend upon the ambient temperature and the direct wind velocity. Under most conditions it will be possible to effect a sufficiently rapid descent to prevent any serious effects of cold.

The 'Bends'

Another interesting aspect of rapid decompression is the possible occurrence of decompression sickness or so-called bends. To date, incapacitating aeroembolism, or bends, has not occurred immediately following decompression at any altitude below 50,000 feet. The production of symptoms of decompression sickness requires a finite stay of altitude. In general, this period is between 4 to 6 minutes at 40,000 feet. It is assumed that a transport aircraft will descend to a lower altitude within this time. In general, it is unusual to see symptoms of decompression sickness at altitudes below 25,000 feet regardless of exposure time. Short duration exposures at altitude, therefore, should not result in any evidence of decompression sickness.

Finally, and by far the worse aspect of a rapid decompression in the unindoctrinated flight personnel, is the resulting demoralization. It has definitely been demonstrated that most personnel can institute muscular reac-

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tion within 1 to 2 seconds after a decompression when they have been thoroughly indoctrinated in its effects and anticipate its incurrence. Delayed reaction time, which can be serious at altitude, ensues as a result of the demoralization and fear produced by a decompression, especially where the flight personnel are not aware of its significance. It must, therefore be emphasized that all flight personnel associated with high performance aircraft, capable of possible decompression, undergo a complete indoctrination involving at least one controlled rapid decompression, and the proper use of oxygen equipment.

(Presented at the MATS Safety Conference, Honolulu, Hawaii.)

Air Line Pilots, Organization Men?

(Continued From Page 4)

equipment on pilot groups helps keep advancements of this kind in proper proportion.

More Diggers

There is the well-known anecdote which was current during the Great Depression. Passing an excavation one man said to another, "we wouldn't have so much unemployment if that hole were being dug with picks and shovels."

The other replied: "by that reasoning things would be a lot better if the hole were being made with teaspoons." The obvious answer to such a problem is shorter working hours for the diesel shovel operators with no loss in pay.

It is futile to fight Automation and Technicological Improvement. Such a negative approach didn't work during the First Industrial Revolution, and it won't work during the Second—the Revolution of Automatic Control. There are some things that a machine can do better than a man can. A well-adjusted automatic pilot can fly straight and level, even make a tight approach better than a pilot can. Why deny it? Human beings should concentrate upon human type activities. For one thing, we don't have a machine which can read a radar scope and evaluate a traffic situation or a weather picture. Automatic flight control frees pilots for evaluative and decision making functions, the things they can do best.

Need Brains

The lazy pilot is in danger of becoming an "Organization Man," in the worst sense. If he abdicates command of his aircraft to non-pilots, and if—as a co-pilot—he leaves every minute decision up to the Lordly Shepherd, the Captain, he is pouring his birthright, the right to think and act as a human being, right down the drain.

That elegant humorist, Dave Kuhn, quips that all he wants to know is where the primary controls of his aircraft are, and what speed it stalls at: but I'll bet my bottom dollar that he is an amiable host to his passengers, and a jolly companion to his crew. What's more, I wager he knows a lot about airplanes and flying. I hope none of the mere control manipulators take seriously his suggestions about limitation of effort.

Dr. Earl C. Kelley of Wayne State University, writing in the Journal of General Semantics (Spring, 1957), on "The Significance of Being Unique," says:

"Intelligence gains great impetus in the natural world, where all is unique; it gets little chance to develop in a standardized world where answers are already provided and where answers can be used again and again. When man allows himself to be standardized, he unwittingly robs himself of the opportunity for intellectual development.

"Through industrialization and its consequent urbanization, man has largely moved from an unique world to a standardized world and thus, in large degree, he has allowed himself to be removed from the need for and the opportunity to develop intelligence."

Tight Going

It's thin ice we skate, this recognition for the need for standardization of procedure, and for automation in some phases of Air Transport activity, on one hand: and the crying necessity for each of us to bring Resourcefulness and Intelligence into play to effect efficiency and improvements in all aspects of our work.

To be an effective human being and a creditable pilot each of us must constantly skate that thin ice, and relish doing it.

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